

The Oceanography Report



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The Oceanography Report

The local point for physical, chemical, geological, and biological oceanographers.

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Marine Science and the Law of the Sea

Introduction

Articles about the Law of the Sea Conference and its implications are certainly not among the most popular literature for marine scientists. Unfortunately, however, this conference and the Draft Convention it is now considering may have more impact on marine science than any of our recent discoveries and hypotheses.

The present law of the sea negotiations (more correctly called the Third United Nations Conference on the Law of the Sea or UNCLOS III) officially started in 1973. Over 150 countries are involved in what is easily the most complex series of negotiations ever conducted. Among the important issues are freedom of navigation for military and commercial vessels, environmental protection, resource access and control, and many legal aspects as well as procedures governing marine science in about 40 percent of the ocean. How these matters evolved, pros and cons of the major issues, and negotiating techniques are discussed elsewhere [see, for example, Dorman, 1979; Kronmiller, 1979; Breaux, 1979; Aldrich, 1980; Richardson, 1980].

A recent development is that the Reagan administration has decided to review all aspects of the Draft Convention to see how it affects various U.S. interests. This review comes at a time when many countries thought that negotiations were almost complete and that only minor points remained for discussion. Regardless of how one feels about a treaty it is fair to say that some aspects, such as deep-sea mining (i.e., nodules) are not too favorable to U.S. interests. Indeed, many would argue that the present Draft Convention has enough flaws in it to prevent its passage by the U.S. Senate. It is very possible that the United States may try for improvements on some issues, which in turn could yield benefits or risks to marine science. It should be appreciated that few countries place the same value on the freedom of marine science research as does the United States. Countries that have tried to protect this freedom include primarily the United States, the U.S.S.R. (until 1978), the Federal Republic of Germany, and the Netherlands, with occasional support from Japan [Miles, 1981]. Only the United States and the U.S.S.R. have active ocean-wide research programs, whereas other developed countries usually have regionally based efforts. Before proceeding further, some background is appropriate.

Marine science prior to UNCLOS III was governed by the regulations established in the First Conference on the Law of the Sea, which was held in 1958; this was the first time that marine scientific research was stated in international law. One of the four conventions that resulted from this 1958 Conference—the Convention on the Continental Shelf—said that

"the consent of the coastal State shall be obtained in respect of any research concerning the continental shelf. Nevertheless, the coastal State shall not normally withhold its consent if the request is submitted by a qualified institution with a view to purely scientific research into the physical or biological characteristics of the continental shelf, subject to the proviso that the coastal State shall have the right, if it so desires, to participate or to be represented in the research, and that in any event the results shall be published."

Even this relatively unrestrictive statement eventually caused some problems for marine research [Kilgour, 1973; Cheek, 1973; Ocean Policy Committee, 1977]. Wooster [1981] recently surveyed the academic, Navy, and NOAA ship operators concerning difficulties for marine research in foreign waters during the 1972-1976 period. He found that in over one fourth of the requests (total of 407), access was denied or inordinately delayed. Prior to and following the first conference and a second one held in 1960, some countries expanded their territorial claims seaward usually also including some control over scientific research. These extended claims, sometimes reaching out to 200 nautical miles, and the anticipation of new marine resources were among the factors leading to UNCLOS III.

UNCLOS III negotiations have produced several iterations of a potential treaty. The most recent one, referred to as the Draft Convention on the Law of the Sea, has been treated as being close to, if not almost, the final document. Although small revisions have been made over the years to the marine scientific research articles, the basic conditions

for research in the territorial sea, the exclusive economic zone (EEZ), and the remaining regions of the ocean are fairly clear. Some argue that the conditions are already part of international law. The new regime for the ocean will, without a doubt, change the way in which marine scientists and marine scientific research operate. The Draft Convention will restrict many activities of U.S. marine scientists, but it may also offer certain opportunities.

An important point in assessing the impact of UNCLOS III on marine science is whether science would be better served without a treaty. It is easy to conclude, however, that although the Draft Convention is not very good for marine science, it is, because of other events, better than no treaty. The reason for this apparently contradictory statement is that as of February 1981, 88 coastal states have already declared some kind of a 200 nautical mile zone out of a total of 135 coastal states. In addition, 66 of these states either explicitly or indirectly claim jurisdiction over marine research in their 200 mile zone [M. H. Katsouras, personal communication, 1981]. With the demise or absence of a treaty, it seems reasonable that the remaining countries will also adopt at least a 200-mile zone. It is also reasonable to assume that the conditions for marine scientific research, without a treaty, will be at least as restrictive as those in the present Draft Convention. These rules would probably differ from country to country and will present a potential administrative quagmire for the U.S. Department of State and, thus, also for the U.S. marine scientists and administrators who will need the State Department for information and permission to do research. Another point is that continuing extension of states' claims farther into the ocean and additional rules for marine science are less likely once a treaty is in place than without one since a treaty will define and limit most jurisdiction.

The general review of the Draft Convention initiated by the Reagan Administration could have an impact on marine scientific research. If the United States decides to withdraw from further negotiations, it is hard to imagine that the science articles could be improved (since the United States is the principle country concerned with marine science in a positive sense), and indeed they could get worse. If the treaty negotiations were to fail because of the United States' withdrawal, scientific research could suffer if countries attempted retribution against the United States for its perceived role in spoiling the conference. If the United States continues in the conference but puts its emphasis in obtaining better conditions for deep-sea mining, some scientific benefits could be negotiated away. Another possibility is that the United States, in its review, decides that improvements in its marine scientific research articles are important and, in some manner, successfully negotiates improvements.

The Law of the Sea negotiations establish several new zones in the ocean and redefine some old ones (Figure 1) within each there are conditions for marine scientific research. The principle zones for marine science are internal waters, territorial seas, straits, archipelagos, exclusive economic zone (EEZ), continental shelf beyond 200 miles, and the 'Area.' A brief description of the new marine scientific regime for each region follows.

Specific Regions

Internal Waters

Coastal states, under the Draft Convention, have complete sovereignty over activities within their internal waters. These waters include rivers, bays, lakes, and other areas on the landward side of the baselines from which the terri-

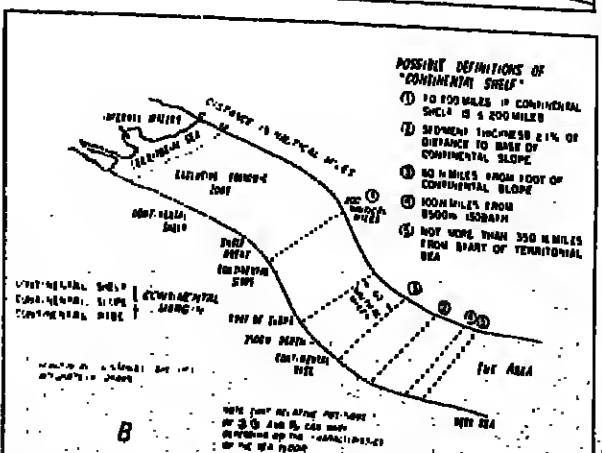
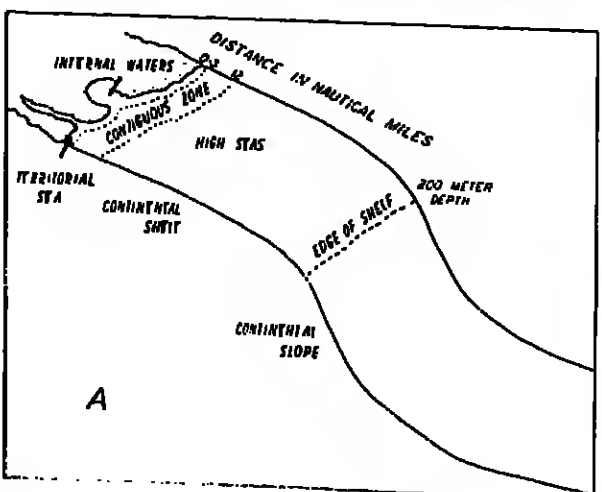


Fig. 1. A comparison of the major divisions of the ocean (a) under the 1958 Geneva Convention and (b) under the Draft Convention (see text for further details).

torial sea is delineated. There are only slight changes from the 1958 Convention on the Territorial Sea and Contiguous Zone, mainly in the methods by which the baseline is measured.

Territorial Sea

The Draft Convention establishes a territorial sea, 12 nautical miles wide, a point that essentially is now an established principle in international law. This, ironically, could actually be an advantage to some scientific work. The U.S. State Department, at present, recognizes only a 3-mile-wide territorial sea; thus, a U.S. researcher has a problem if he or she wants to work, say, 100 miles off a country that has declared a 200-mile territorial sea. In this fairly common situation, the U.S. State Department generally would not make the permission request, since to do so would be a tacit acceptance of that country's claim. Alternatives for a researcher are to request permission to work within 3 miles of the coast (in which case the U.S. State Department could ask for permission) and actually to conduct the research there (and at 100 miles) at an increased cost to the project or to avoid the problem and work outside of 200 miles. With an internationally accepted 12-mile territorial sea and the protection afforded to the coastal state by the EEZ (see next section), some of the diplomatic problems associated with various territorial sea claims should be eliminated. This is not a small point, since, as of May 1981, 80 states claim a 12-mile territorial sea, 25 claim more than 12 miles (14 of these claim 200 miles), and only 28 states claim less than 12 miles (Office of the Geographer, U.S. Department of State). The Draft Convention, if accepted, should eliminate claims of more than 12 miles for a territorial sea.

Within the territorial sea the coastal state has "the exclusive right to regulate, authorize and conduct marine scientific research . . . [which] shall be conducted only with the express consent of and under the conditions set forth by the coastal State" (Article 245).

Although coastal states have sovereignty over the territorial sea, there is a right of innocent passage. However, "the carrying out of research or survey activities" is eliminated as an accepted activity under innocent passage. Thus the control over marine scientific activities in a well-defined territorial sea is clear. However, no statements are made concerning the mechanisms necessary to get permission or the conditions that a coastal state can impose on a researching state or institution if they want to work in a country's territorial sea. Presumably, such arrangements would be made on an ad hoc basis.

Straits

The international acceptance of a 12-mile-wide territorial sea will affect many previously international straits. One hundred and sixteen straits are more than 6 but less than 24 miles wide and would now be included within the territorial sea of the adjacent states [U.S. State Department, 1974]. Article 40 in the Draft Convention says that "foreign ships, including marine scientific research and hydrographic survey ships, may not carry out any research or survey activities without prior authorization of the States bordering straits." This restriction could make it very difficult to conduct research in such straits. In part because usually two or more states will have to give permission. Straits between major bodies of water (Bab el Mandeb or Gibraltar, for example) are obviously important and interesting areas for study. A further complication concerning strait research is the absence of statements concerning the mechanisms for getting permission to do research and the restrictions or conditions that a coastal state can place on the research. Implied consent, which exists in the EEZ, does not extend to research in straits where the unclear conditions and mechanisms of the territorial sea apply.

Archipelagos

A series of articles in the Draft Convention will permit a land state to define baselines for archipelagic waters. The actual extent of these waters is not clear, and definition probably awaits jurisdiction. What is clear is that the land state will have territorial sea rights over its archipelagic waters for scientific research.

Exclusive Economic Zone

The exclusive economic zone or EEZ is a new concept and presents a major problem for marine science. It extends 200 nautical miles (370 km) from the baseline from which the territorial sea is measured (Figure 1b). Thus, it includes all the coastal waters of the world and most of the continental shelves (in the geological sense). It encloses (with the territorial sea) about 32% of the ocean (Figure 2). Prior to UNCLOS III much of this area was open to many forms of marine scientific research. The conditions for marine scientific research in another country's EEZ are consistent with numerous requirements. The important aspects are as follows:

1. Consent is necessary and shall in normal circumstances be granted (Article 248, part 2). It can be denied if the project (a) is of direct significance for the exploration and exploitation of natural resources, whether living or non-living; (b) involves drilling into the continental shelf, the use of explosives or the introduction of harmful substances into the marine environment; (c) involves the construction, operation or use of artificial islands; . . . (d) contains inaccurate information or if the researching State or competent international organization has outstanding obligations to the coastal State.

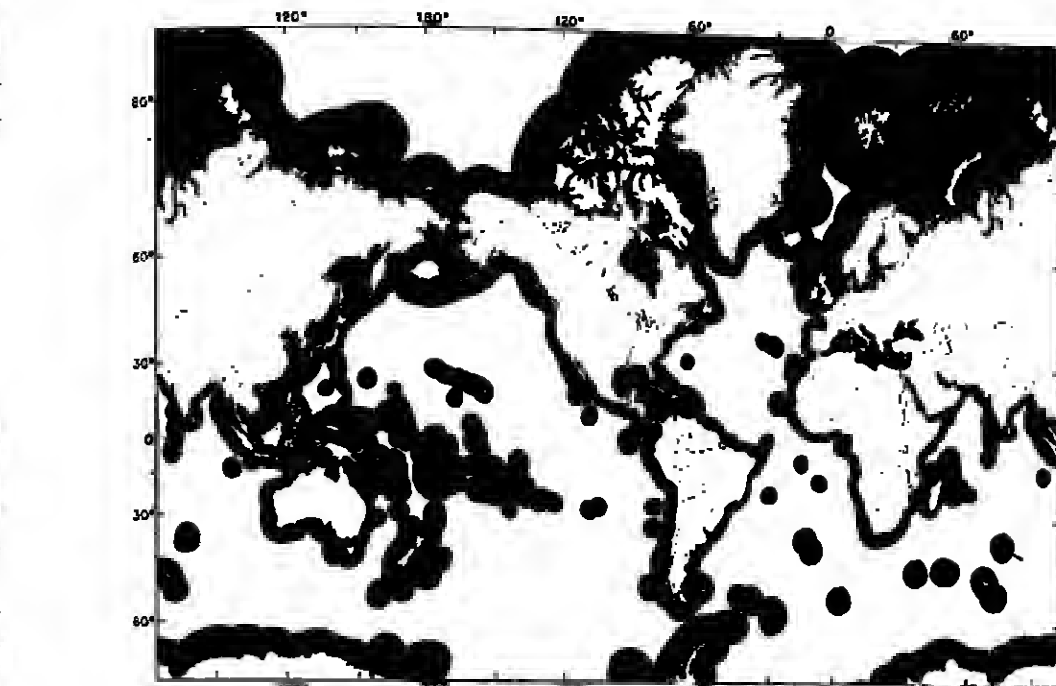


Fig. 2. The area of the ocean covered by a 200-nautical mile Exclusive Economic Zone (EEZ). Note that this is a Mercator projection and that the size of the polar regions is exaggerated [from Ross, 1980].

part 5). A coastal state's decision based on the above provisions is not reviewable by a third party.

2. Specific information must be supplied not less than 8 months before the start of the project. This includes (a) the nature and objectives of the project; (b) the method and means to be used, including name, tonnage, type and class of vessels and a description of scientific equipment; (c) the precise geographic areas in which the project is to be conducted; (d) the expected date of first appearance and final departure of the research vessels, or deployment of the equipment and its removal, as appropriate; (e) the name of the sponsoring institution, its director, and the person in charge of the project and (f) the extent to which it is considered that the coastal State should be able to participate or to be represented in the project (Article 248).

3. Specific conditions must be met. Applicants asking for consent to conduct research must (a) "ensure the right of the coastal State, if it so desires, to participate or to be represented in the marine scientific research project, especially on board research vessels . . ."; (b) provide preliminary and final reports; (c) provide access for the coastal State to all data and samples from the project and "furnish it with data which may be copied and samples which may be divided without detriment to their scientific value"; (d) provide, if requested, an assessment of such data, samples and research results or provide assistance in their assessment or interpretation; (e) ensure that research results are made internationally available through appropriate national or international channels; (f) "inform the coastal State immediately of any major change in the research programme" (Article 249).

4. Communications concerning the marine scientific research project shall be made through appropriate official channels unless otherwise agreed (Article 250). These channels probably are foreign ministries and the U.S. Department of State which surely will lessen the role of scientist-to-scientist relationships that so often have been successful in developing projects.

5. Coastal states can suspend research activities if (a) it is not being conducted in accordance with the information communicated (i.e., information requested in Article 248) or if the conditions specified in Article 249 are not met; (b) there is a major change in the research project or activities (Article 253).

6. After permission to conduct research is granted, landlocked and geographically disadvantaged States in the region may request to receive the information provided under points 2 and 3, above. These states may also participate, when feasible, in the project through qualified experts, although the coastal state can object to the choice of expert.

Notwithstanding the foregoing conditions, consent is implied, and the researching state or organization may begin research 6 months after submitting its request if the coastal state has not denied consent within 4 months after receiving the information specified in Articles 248 and 249. However, the coastal state can ask for additional information and postpone, almost indefinitely if it desires, a decision. Therein lies one of the biggest problems of the Draft Convention: the lack of predictability concerning a cruise.

Continental Shelf Beyond 200 Miles

The continental shelf in the Draft Convention has a complex definition (see Figure 1b) that extends it to a distance of 200 nautical miles (i.e., coterminous with the EEZ). If the continental margin (shelf, slope, and rise) does not extend to 200 nautical miles, the continental margin extends beyond 200 nautical miles, several definitions come into play based on the thickness of the sedimentary rocks (how this thickness is determined is not stated) or distance from shore, but, in any case the limit of the continental shelf shall not exceed 350 nautical miles from the territorial sea baseline or 100 nautical miles from the 2,500 m isobath. The exact areal extent of this region cannot be determined at this time, but it is thought to be about 6-8% of the ocean. The provision concerning sediment thickness for delineation certainly will permit confusion and allow for excessive claims.

All the marine scientific conditions mentioned above for the exclusive economic zone also apply to the Continental Shelf except that a coastal state may withhold consent only in specific areas that it has publicly designated as subject to exploitation or detailed exploratory operations within a reasonable period of time. In addition, research in the water column beyond the limits of the EEZ is permitted.

The Area

The region outside of coastal state jurisdiction is defined in the Draft Convention as the Area (i.e., the remaining 80% or so of the ocean). Basically, there are no significant restrictions in the Draft Convention concerning marine scientific research in the Area. However, there is a provision for a review conference to be held 15 years after commencement of commercial production of mineral resources (nodules) from the Area that could have the potential for mischief. A suspicious mind could imagine freedom of marine scientific research being regarded as a negotiating chip that might be surrendered by the United States or other developed countries in return for assured and continuing access to ocean minerals. If ocean thermal energy conversion (OTEC) is found to be a successful source of energy, regulations concerning the water column could also be developed.

The Draft Convention does say that "states and competent international organizations shall promote and facilitate the development and conduct of marine scientific research in accordance with this Convention" (Article 239) and that coastal states should "endeavour to adopt reasonable rules, regulations and procedures to promote and facilitate marine scientific research . . . beyond their territorial sea and to facilitate . . . access to their harbours and promote assistance for marine scientific research vessels" (Article 255). Although these statements are valuable, they are not binding.

Publication Problems

A major general concern for science in the Draft Convention is publication rights and the flow of scientific data. Article 249, paragraph 2, requires "prior agreement for making internationally available the research results of a project of direct significance for the exploration and exploitation of natural resources." This is a confusing statement since Article 246, paragraph 5a, allows coastal states to withhold permission for research in their EEZ or for their continental shelf beyond 200 miles if the project is of direct significance for the exploration and exploitation of natural resources, whether living or non-living. A difficulty for open publication is that almost any type of marine research could have some relevance to resources, and such an interpretation during or after the work could effect publication rights. It should also be repeated that the coastal State has complete discretion to determine what research is of direct significance for resources, and thus it is possible for a coastal state to deny consent for almost any type of marine research. This is a major change from the 1958 convention where open research was encouraged.

Implications and Recommendations

The above conditions clearly indicate the need for change by U.S. marine scientists, institutions, and funding organizations in their manner of operation. Many of the articles mentioned above have pitfalls, and clearly any foreign country that wishes to refuse or delay a project should have no trouble finding a justification. Alternatively, if a country supports the research, the detailed requirements for foreign participation in research and sharing of data. These latter two items and others could involve additional costs beyond that of the initial project. As a coastal state can deny a research request from a country if there are outstanding obligations against a previous project by that country, how and when a research project ends should be clearly defined in early negotiations. The previously mentioned problems for publication is important and should also be reconciled in early stages of negotiation. The point that research activities can be suspended if there is a major (undefined) change in the project also poses potential difficulties. Changes can occur owing to ship breakdown, loss of equipment, weather problems, or adjustment of cruise objectives in accordance with scientific information gained during the cruise. A coastal state will, under the Draft Convention, have the ability to effect or stop a project in almost any phase of its activity.

Once (or if) the Draft Convention is opened for ratification there might well be a transition period of several years before it is approved. During this period the U.S. State Department might either follow the present U.S. position on the various issues (such as the 3-mile territorial sea) or the

Draft Convention. Either situation could present potential for confusion, unnecessary delays, rejections, or avoidance of research requests. (Similar and perhaps more complex problems are possible if the United States withdraws from the treaty negotiations or if a treaty fails.)

Two indirectly related aspects may cause a reduction in U.S. marine science efforts within foreign EEZs. The first is that scientists and institutions just may avoid working in certain areas because of anticipated or past difficulties in conducting research there. This may already be seen in the general avoidance of waters off Trinidad and Tobago, India, and the Soviet continental shelf. By such avoidance, we can make the problems of the Draft Convention come true without even trying. Second, our own government may require a stricter adherence to the Draft Convention than individual countries might impose. In addition, having to deal through official channels could discourage many individual scientists. As marine scientists we should be prepared and willing to test and, if necessary, even challenge strict or arbitrary interpretations to see if we can work out agreeable arrangements, such as bilaterals [see *Open Policy Committee*, 1981] rather than letting activities overtake us.

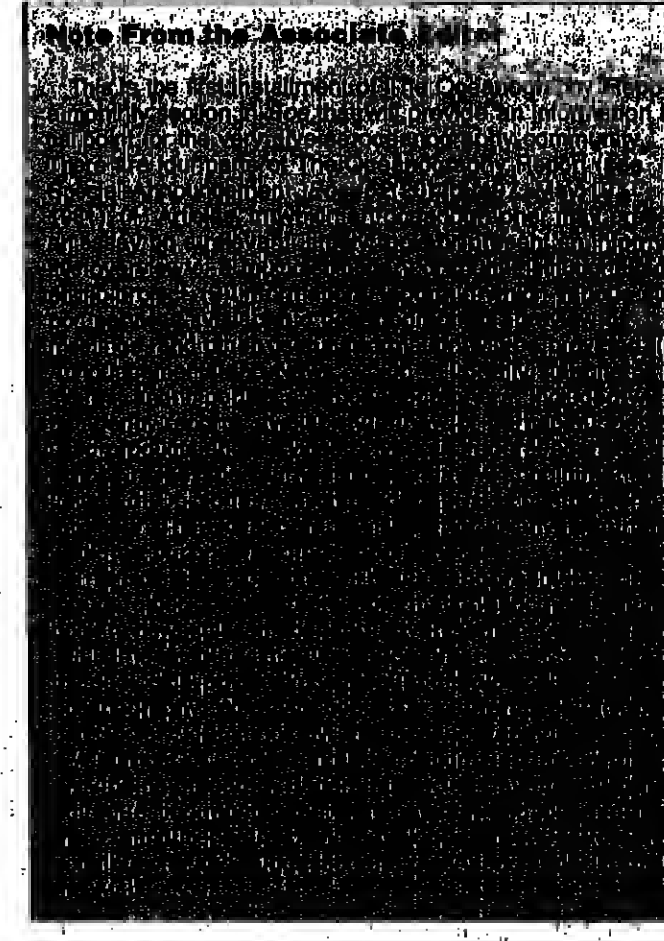
For U.S. marine science and marine scientists to continue their future research activities in the world ocean certainly will imply additional administrative and funding considerations. Perhaps most important is that the development of foreign programs will require more time and impose additional costs. The necessity of having at least a 6-month lead time to get permission has implications for grant approval by organizations like the National Science Foundation and the Office of Naval Research, which tend to operate on a 1- or 2-year financial calendar.

Concern and opportunities should be established for preliminary meetings between U.S. and foreign scientists and administrators for the development of joint programs as well as to increased support for U.S. scientists to participate in international meetings such as the Intergovernmental Oceanographic Commission (IOC). Perhaps a separate funding source should be established and used to explore and discuss possibilities for foreign programs. The importance of participating in international organizations like the IOC stems from Article 247 of the Draft Convention, which provides a mechanism by which such organizations can get consent for projects in the waters of member states.

Funding organizations and research institutions will have to be aware of the conditions on marine research under the new ocean regime and recognize that training of foreign scientists, data evaluation, and the like will be common components of research projects. Scientists, especially young ones, should not be penalized by participating in such activities even though it will divert them from their prime scientific objectives. Large or active institutions should consider the establishment of a foreign office that can help their scientists, administrators, and the funding agencies in developing and keeping track of foreign activities. It would be naive to think that the average scientist could wander through the potential maze of regulations imposed by the Draft Convention without any help and come out many years later with an administratively, scientifically, legally, and internationally satisfactory program, and be willing to try it again. On the other hand, the U.S. State Department, funding agencies, institutions, and individual scientists should be able to survive and even thrive in this new regime if we work together.

Acknowledgments

Many of the thoughts expressed in this note have evolved from discussions with my colleagues on the Freedom of Ocean Science Task Group of the Ocean Policy Committee of the National Academy of Science. In particular, I would like to acknowledge William T. Burke, John V. Byrne, John P. Crevan, Paul M. Fye, Mary Hope Katsouras, John A. Kneuss, Edward L. Miles, Roger Revella, Mark Talwani, and Warren S. Wooster but am not implying that they agree with everything I have said. Support for writing this note has come from the Department of Commerce, NOAA, Office of Sea Grant under grant NA80AA-D-00077 and the Paw Memorial Trust.



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Opinion



Figure 2 of Ross' article, 'Marine Science and the Law of the Sea,' is the conventional illustration of the 'Exclusive Economic Zone' that would be established by a 200-mile limit. A more realistic view of the impact is obtained by plotting the 200-mile limit on an equal area projection. The above map is an oblique Hammer equal-area projection with interruptions such that the world ocean is shown as a unit. (Figure from Athelstan Spihaas, Middleburg, Virginia.)

Information Reports

Special Sessions Headline Fall Meeting

Two special sessions have been added to the oceanography roster for AGU's Fall Meeting, bringing the total of special oceanography sessions to 14, according to Barbara Hickey, Fall Meeting program chairman for oceanography. The Fall Meeting will be held in San Francisco from December 7 to 11; the deadline for abstracts is September 16. Details for submission of abstracts were published in the June 30 issue of *Eos*.

A session on MARSEN (Marine Remote Sensing Experiment) is one of the new additions to the meeting. MARSEN, an international collaborative experiment, was conducted in the North Sea between August and November 1979, reports Omar Shemdin at the Jet Propulsion Laboratory (JPL). The experiment explored the application of remote sensing techniques to detect surface waves, wind, current, and surface expression of oceanic fronts, and to understand better depth-limited oceanic processes. For additional information, contact Omar Shemdin at JPL, Mail Stop 183-501, 4800 Oak Grove Drive, Pasadena, CA 91103 (telephone: 213-354-2447).

The second new session will review the POLYMODE Local Dynamics Experiment, which was designed to observe mesoscale eddy processes in the southern part of the Gulf Stream Recirculation region. The program included velocity, temperature, salinity, and oxygen profiling, current meter moorings, and SOFAR floats. Most of the material in the session has never been presented to a broad audience. Included on the agenda are principal descriptive results of the experiment and preliminary dynamical interpretation of the mesoscale processes that occurred during the experiment. Additional information can be obtained from Bruce Taft, PMEL-NOAA, 3711 15th Avenue, N.E., Seattle, WA 98105 (telephone: 206-543-7129).

An AGU session on Marginal Ice Zone (MIZ) Processes also is on the agenda for the Fall Meeting. The session is particularly appropriate at this time, notes Robin Muench of SAI/Northeast, because a major international

program (the Marginal Ice Zone Experiment, or MIZEX) is in the final planning stages; field activities are scheduled to commence in 1983. The session will provide an excellent forum for updating and synthesizing results from the increasingly active MIZ-related programs. In addition, the session will provide valuable input for MIZEX. Session topics will include oceanic, atmospheric, and sea-ice processes that relate to the MIZ and regional aspects of the results. An invited overview presentation will be made by Ole Johannessen of the University of Bergen, Norway. Saeve Martin of the University of Washington in Seattle will present a contributed talk on the formation of ice factors along the MIZ. For additional information, call Robin Muench, the session chairman, at 206-747-7152.

A session on HEBBLE (High-Energy Benthic Boundary Layer Experiment) also will highlight the meeting. HEBBLE is an integrated, multidisciplinary deep ocean program funded by the Office of Naval Research. The scientific goal of this effort, according to Charles Hollister at Woods Hole Oceanographic Institution and project director, is to quantify the magnitude of deep-ocean currents and their temporal and spatial variability and to predict the response of the cohesive, biologically altered sediment to the imposed stresses. The long-term goal is to formulate and field-verify a predictive sediment-transport model for cohesive material in high-energy areas. The session is timely, according to Hollister, because it follows a very exciting 1981 field season in the North Atlantic. For additional information, contact Charles Hollister at WHOI, Woods Hole, MA 02543 (telephone: 617-548-1400, ext. 2200).

Papers to be presented at the MANOP (Manganese Nodule Project) session will present some of the most recent work done in the project, which studies the processes that control the distribution and composition of deep-sea manganese nodules. Through a series of integrated experiments, MANOP is attempting to identify the sources and fluxes of transition metals to the sediment-water interface. MANOP is also attempting to resolve the partitioning of the elements between particulate debris, bottom and pore waters, and nodule and sediment phases at a small number of 'type' Pacific deep-sea environments. For additional information, contact Jack Dymon at the Oregon State University, Corvallis, OR 97331 (telephone: 503-754-2296), or Paul Dauphin, University of Rhode Island, Kingston, RI 02881 (telephone: 401-792-6127).

Other special sessions and their contacts (and telephone numbers) are listed below.

West Coast Circulation: Bob Baardsley (617-548-1400, ext. 2536); **Vermé Channel: Hydrography, Geochemistry, and Sediment Dynamics:** Pierre Biscaye (914-359-2900) or Dava Johnson (617-548-1400, ext. 2463); **Hawaii-Tehiti Shuttle Experiment and Mid-Latitude Large-Scale Variability:** Dava Cutchin (714-452-3226); **Dynamics of Coastal Circulation Over Topographic Features:** Phil Hsieh (904-644-2525); **Coastal Oceanography and Paleo-oceanography:** Barbara Hickey (206-543-4737); **Estuarine Processes—Physical, Chemical, and Biological:** Dave Paterson (415-323-6111); **SANDS (Shelf and Nearshore Dynamics of Sedimentation):** Chuck Nittrouer (919-737-3711); **Southern Ocean Studies:** Worth Nowlin, Jr. (713-645-2847).—BTR

Ocean Drilling Reorganized

The National Science Foundation has combined its proposed Ocean Margin Drilling Program (OMDP) with the existing Deep-Sea Drilling Program (DSDP). This reorganization calls for the retirement in 1983 of DSDP's mainstay, the *Glomar Challenger*, which is nearing its 14th year of operation. The *Glomar Explorer*, the former CIA ship, with 6 times the carrying capacity of the *Challenger*, will become the sole NSF drilling ship.

Engineering and science planning for OMDP will continue largely unchanged with the new plan, though the schedules for achieving some scientific objectives may change, according to the Joint Oceanographic Institutions, Inc. (JOI), a consortium of 10 academic oceanographic institutions. Additional industry and foreign support will be sought under the new plan.

Reaction from the academic community has been positive. Response from the petroleum industry, which shares with NSF the cost of OMDP, is mixed, but understandably so: the reorganization will delay by several years drilling along the passive ocean margins that could lead to the discovery of oil and gas deposits.

Although the details of the plan have yet to be hammered out, the first phase of the *Explorer's* conversion is expected to begin in fiscal 1983 and to continue into fiscal 1984. Launch of the newly outfitted *Explorer* is anticipated in mid-to-late 1984, according to Allan M. Shinn, Jr., director of the new Office of Scientific Ocean Drilling; the office was created by NSF Director John Slaughter in early August to smooth the merger transition. Shinn, formerly senior science associate to Slaughter, noted that there will be no drilling for 8 months to 1 year.

Retirement of the *Explorer*, now mothballed in Suisun Bay (north of San Francisco, Calif.), will give the ship drilling capabilities similar to those of the *Challenger*. Two to three years later, the *Explorer* will go back to the yard for a second conversion to add riser and well-control technologies, which make possible drilling on the passive ocean margins by controlling the pressure encountered if the drill accidentally strikes hydrocarbon deposits.

Changes in the drilling program were spurred by a lack of consensus on the scientific objectives for ocean drilling, Shinn told *Eos*. The *Explorer*, when it is ready, will allow the scientific community to set goals without the physical constraints of the working drill platform, he explained. Additional impetus came from the tightening of the federal budget. "It's clear that NSF can't consider operating 2 ships," said Shinn. Operation costs for the *Challenger* are about \$25 million (1981 dollars) per year; for the *Explorer* per year, its costs would equal about \$40 million (also 1981 dollars), excluding rehabilitation costs.

Shinn reports that the academic community's response has been positive. In addition, the executive committee of the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), an international organization of advisory panels and committees, met in Germany the week of August 10 and unanimously agreed that putting the two programs together was a good idea. Informal responses from foreign nations also have been optimistic, Shinn said.

Petroleum industries, though, are more reluctant to give the plan hearty approval. The 10 oil companies that agreed last year to match funds with NSF to finance OMDP first heard about the reorganization at a July 22 meeting with John Slaughter in Houston. J. B. Coffman, vice president for exploration at the Exxon Production Research Co., stressed that Exxon has not completed its analysis nor adopted an official position on the new plan. He did say, however, that he thought it was good for the government's program direction to have one research vessel. Even so, Coffman is unsure of the cost effectiveness of the program. Fewer holes will be drilled with the riser technology, and, although this will reduce the bottom-line cost, the cost per well drilled will be higher in the new plan when the conversion costs for the *Explorer* are considered, he told *Eos*.

Ten other petroleum companies were invited to participate in the ocean drilling program, and they attended the Houston meeting. NSF expects to supply the oil companies with a detailed conversion plan in June 1982, Shinn said, which will include an integrated science plan for the *Explorer*, an operation and control management plan, and detailed designs and cost estimates for the ship's conversion.—BTR

Announcements

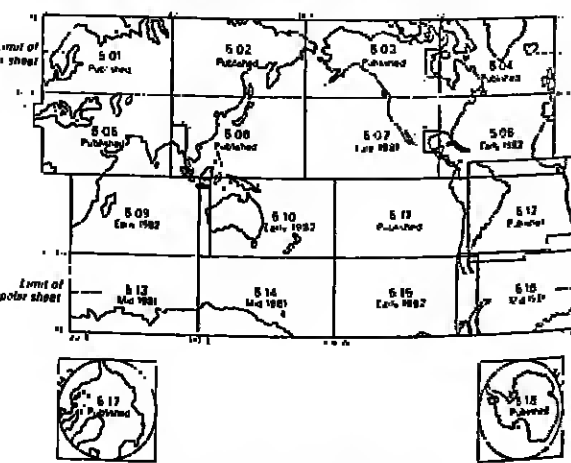
Bathymetric Charts Near Completion

The fifth edition of the 'General Bathymetric Chart of the Oceans' (GEBCO), the series of bathymetric charts that originated at the Seventh International Geological Congress in Berlin in 1899, will be complete soon.

Thirteen of the final 18 charts that cover this world are available. The last chart should be complete next May. All of the charts have a scale of 1:10,000,000; polar sheets are 1:6,000,000.

Guiding the chart production is a joint committee of marine geologists and geophysicists from the International Hydrographic Organization and the Intergovernmental Oceanographic Commission of UNESCO. Cartographic production of the sheets is undertaken by the Canadian Hydrographic Service in Ottawa. The basic project, grid, and land work is taken from the Carte Generale du Monde by permission of the Institut Geographique National in France.

Sheets are available at \$5.00 (Canadian) plus handling charges from Hydrographic Chart Distribution Office, Department of Fisheries and the Environment, 1875 Russell Road, P.O. Box 8060, Ottawa, Canada K1G 3H6.



NOAA Starts Oceanography Publication

A new NOAA publication entitled *Oceanographic Monthly Summary* began in January. The publication, edited by Steve Auer, replaced two other NOAA periodicals, *Gulf Stream and Fishing Information*, and it will attempt to disseminate the monthly oceanographic information in a more timely and efficient manner than did the other two publications.

Oceanographic Monthly Summary contains 15 sea surface temperature (SST) analyses, 3 oceanographic thermal feature analyses, and a Bering Sea/North Slope ice analysis. The SST analyses include monthly means, anomalies, and yearly changes for the Atlantic and Pacific oceans and the Gulf of Mexico in both 2° and 1° latitude/longitude scales. The ocean feature analyses show and describe monthly activity of the Gulf Stream system and its eddies for the northwest Atlantic and Gulf of Mexico, as well as other observed thermal features for the western U.S. coast. The Bering Sea/North Slope ice analysis describes sea ice age, thickness, and coverage for the Bering Sea and Chukchi Sea.

The National Weather Service and the National Earth Satellite Service jointly sponsor the publication.

JGR on Seasat

A special issue of the *Journal of Geophysical Research* will be devoted to scientific results from Seasat. The journal, published by the American Geophysical Union, is a leading journal in the field of oceanography, meteorology, geodesy, and geophysics. The special issue will contain results from the Seasat satellite mission, which was launched in June 1981. The special issue will be published in the November 1981 issue of the journal. The special issue will be edited by John Slaughter, Director of the Office of Scientific Ocean Drilling, NSF.

born of the tentative title of your manuscript by October 1, 1981. Authors are encouraged to submit manuscripts as soon as possible but no later than December 1, 1981. Standard JGR review procedures will be followed.

Geodesy and glaciology manuscripts should be sent in quadruplicate to Thomas J. Ahrens, Seismological Laboratory 252-21, California Institute of Technology, Pasadena, CA 91125.

Manuscripts in other disciplines should be sent in quadruplicate to A. D. Kinvar, Jr., Department of Marine Science, University of South Florida, 630 First Street South, St. Petersburg, FL 33701.

New Publications

Descriptive Regional Oceanography
P. Tchamla, Pergamon Mar. Ser. vol. 3, Pergamon, New York, xvii + 253 pp., 1980.

Reviewed by L. K. Coachman

This book is a very nice elementary description of the hydrography of the World Ocean (the unity of the oceans is emphasized). Hydrography is used in its classical sense: the observed distributions of temperature, salinity, and density. Distributions of other properties are not included, though occasionally oxygen concentration is mentioned as an aid in interpretation (e.g., as a corroboration of the time a water mass has been removed from the surface). There are no equations and hence no heat and salt budgets. Though current speeds and transport values are given, water budgets derived from these are only implicit. The roles of advection and mixing in creating the hydrographic distributions are introduced solely in a qualitative way. In short, this book is, as the title says, a description of World Ocean hydrography. But it is more than that. The description is included within a discussion of the ocean basin form and topography, wind systems, climatology, and even (briefly) sediment distributions. Thus, the reader can be informed not only what the ocean looks like, but why, qualitatively, it looks as it does.

The World Ocean is described in four main parts: the Southern Ocean, followed by the Atlantic, Indian, and Pacific in order. The description of each region follows the plan: (1) form, dimensions, location; (2) topography, sediments; (3) atmospheric pressure, winds, basic climatology; (4) general surface circulation; and (5) hydrology—distribution of S and T, structure and water masses, origin and formation of water masses, movements of water masses, and relation to other oceans.

At the beginning are three short chapters containing basic concepts of the morphology of the earth and ocean basins, physical and chemical characteristics of seawater, and the distribution of T, S, and density. Throughout, most points are illustrated by appropriate horizontal or vertical sections, charts, and graphs, and 19 separate plates are

In addition, please send one manuscript copy to George H. Born, Jet Propulsion Laboratory, M/S 284-737, 4800 Oak Grove Drive, Pasadena, CA 91108.

Meetings

Ocean Hydrodynamics Colloquium

The 14th International Colloquium on Ocean Hydrodynamics will be held at the University of Liège, Belgium, May 3-7, 1982. The subject will be 'Marine Hydrodynamics of

clear pectorals of pertinent features such as general circulation, summer and winter surface temperatures, prevailing winds, precipitation, etc. Everywhere the author has attempted to stay with the 'big picture,' avoiding the linear scales of temporal and spatial variability so dominant in the results of physical oceanographic descriptive study of recent decades. The approach is definitely classical, in the manner of Schott, Sverdrup, and Dietrich.

The book was developed from lectures at the University of Paris for beginning students in a general oceanography course. In Tchamla's words, "... It quickly became apparent that the students, whether physicists, biologists, chemists, or geologists, had only the most fragmentary knowledge of the oceans ...". In my words, they were oceanographically illiterate. This is true of students coming into most oceanographic curricula everywhere. But what frequently happens is the students all too rapidly become involved in the myriad details of their specialty and never do get a feeling for the geography of the World Ocean. Thus, I perceive this book to be a very useful contribution to the suite of oceanographic textbooks. It could be used as a primary text in the first course for all oceanography majors, regardless of specialty. It would not be the sole text, as some amplification is necessary to provide a satisfactory introduction. For example, though TS analysis is employed in the water mass descriptions, the concepts of TS analysis are not discussed.

The book is well produced, the type and figures are clear, and the thick cover edition I have seems well bound. The translation (from French) is excellent. Typographical errors are few and far between, some of which derive from the translation, but none I spotted inhibited understanding. I commend this work to all those engaged in teaching future oceanographers, to the extent of perhaps even influencing the ordering of the subject matter in their present curricula. It will also serve well anyone who wishes a concise overview of the hydrography of the World Ocean.

L. K. Coachman is with the Department of Oceanography, University of Washington, Seattle, Washington.

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Research Associate/Research Microprobe. The Electron Microscopy Center at Texas A&M University invites application for the position of research microprobe specialist. Applicants should possess a working knowledge of WDS and EOS spectrometers and accompanying computer and software programs and preferably have had experience in the geological sciences.

The primary duties of the position are to oversee the use of the microprobe and to assist in the analysis of microprobe and ancillary equipment and to assist in teaching graduate course laboratories.

Salary will be a maximum of \$20,000/12 months. Applicant should send supporting data and letter of recommendation to:

Dr. E. L. Thornton
Texas A&M University
Geological Sciences Building
College Station, Texas 77843
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Engineering Geologist/Geophysicist

The Department of Geological Sciences, University of Saskatchewan, has a vacant tenurable position in engineering geology/geophysics. Applicants should be qualified to teach undergraduate and graduate courses and to conduct research in engineering geology. A background in structural geology may be appropriate. Well-equipped facilities are available for research in rock mechanics, fluid flow through porous media, acoustic, and electrical properties of rocks, and permafrost. Good opportunities exist for joint research with qualifications and experience. Send applications, detailed personal resumes including the names of at least three references, and other supporting data to Dr. W.G.E. Caldwell, Head, Department of Geological Sciences, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 0W0.

Please note: until November 15, 1981 consideration will be given only to applicants who are Canadians or landed immigrants; after that date all applications will be considered.

Faculty Positions: The University of Iowa

The Department of Physics and Astronomy anticipates one or two openings for tenure-track faculty in August 1982. One or more visiting professorships, at any rank, are also expected to be available. Preference will be given to candidates with research activity in the following experimental and theoretical areas: astronomy, astrophysics, atomic physics, condensed matter physics, elementary particle physics, nuclear physics, plasma physics, and space physics. The positions involve undergraduate and graduate teaching, guidance of research students, and personal research. Interested persons should send a resume, a statement of research interests, and the names of three professional references to Search Committee, Department of Physics and Astronomy, The University of Iowa, Iowa City, IA 52242.

The University of Iowa is an equal opportunity/affirmative action employer.

Research Positions/Seismology. Applications are invited for two possible research positions in the Institute for Geophysics, University of Texas at Austin, an equal opportunity employer.

Both positions involve field work on seismograph stations in Latin American countries; analysis and interpretation of data acquired from these networks and related geophysical studies in the Caribbean and South America.

One Ph.D. level and one B.S./M.S. level positions are available. Salary for either position will be arranged depending on experience. Please send resume and bibliography to: Tosieme M. M. M., Institute for Geophysics, University of Texas at Austin, 700 The Strand, Galveston, Texas 77550.

Assistant/Associate Professor

Mackay School of Mines
University of Nevada-Reno

The Department of Geological Sciences invites applications for the tenure-track academic year position of assistant or associate professor of Geology to teach undergraduate and graduate courses (M.S. and Ph.D.). We are seeking an outstanding person with potential for teaching, establishing new laboratories and conducting and supervising research in the Basin and Range and adjoining Provinces. Publishable research will be expected. Areas of expertise within geology which will receive favorable consideration are structural geology, sedimentology, stratigraphy and carbonates petrology.

The position will be filled in either January or August 1982, depending on the availability of candidates. The Ph.D. or equivalent degree is required. Salary and rank will depend on education and experience. Candidates should send a letter of application, list of publications, statement of teaching and research interests and transcripts and should arrange for at least three letters of reference to be sent to the Department. Closing date for application is November 15, 1981. Applications are to be sent to: Dr. L. C. Hsu, Chairman, Faculty Search Committee, Department of Geological Sciences, Mackay School of Mines, University of Nevada, Reno, NV 89557.

University of Nevada is EOE/AFE.

Geophysicist. Faculty position for 12-month, tenure track appointment. A sea-going marine seismologist with interests in seismic reflection, refraction and microseismicity is sought. Candidates with strong backgrounds in non-marine seismology or other branches of marine geophysics will also be considered.

Duties include maintaining active research programs and obtaining outside funding, teaching graduate courses and supervising graduate students. The position is a full-time position. Applicants who meet all requirements, but have less experience than is normally required for Assistant Professor rank, will be considered for appointment at the rank of Assistant Professor. Salary—\$24,000 to \$37,000, commensurate with experience.

Send resume and names of three references by October 1981 to: G. Ross Heath, Dean, School of Oceanography, Oregon State University, Corvallis, Oregon, 97331.

OSU is an affirmative action/equal opportunity employer.

New Zealand Embassy. New Zealand Embassy, Observatory Circle, NW Washington DC 20008.

United States of America.

Closing date for applications November 3, 1981.

the Equatorial Ocean,' with emphasis on theoretical oceanography.

Members of the Organizing Committee are Jacques Nihoul, Jens Meincke, David Anderson, Dennis W. Moore, James J. O'Brien, and S. G. H. Philander. Those who wish to present papers should contact Dannie Moore at JIMAR, University of Hawaii, Honolulu, HI 96822, or Jacques Nihoul at Geophysical Fluid Dynamics, University of Liege, Belgium. Nongovernment U.S. participants may contact Jan Witte at Nova University Oceanographic Center, 6000 North Ocean Drive, Danla, FL 33004, for possible travel support.

Coastal Upwelling

Francis A. Richards, editor

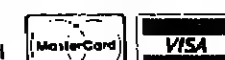
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Position in Reflection Seismology/Rice

University, Houston, Texas. The Department of Geology plans to expand its geophysical program. Emphasis will be on reflection seismology. At this time applications are for the first of two open faculty positions. The successful applicant will help in the search for and selection of the second faculty member.

Your main responsibility will be to lead our department into the area of modern reflection seismology. Your main teaching and research interests should be in the acquisition and processing of reflection seismic data. You should also help in developing rigorous undergraduate and graduate curricula, which are supported by the traditional strength of the Math Sciences, Physics, and Electrical Engineering Departments at Rice. Emphasis is to work with and undertake some joint projects with our geologists is essential.

Our plans are to acquire a computer system configured for high quality data processing. Substantial seed money for this facility is already in hand. Creative cooperation with the oil and geophysical industry in Houston, including a reasonable amount of consulting, is encouraged. Salary will be commensurate with qualifications and experience. Please send your curriculum vitae, a summary of experience in seismic processing, a statement of research interests, and names of three or more references to Dr. A. W. Bally, Chairman, Department of Geology, Rice University, P.O. Box 16992, Houston, Texas 77001. Application deadline—October 1, 1981.

Rice is an equal opportunity employer.

Petroleum Geophysicist/New Zealand Geological Survey. New Zealand is undergoing major expansion of its energy resource investigation including prospecting for hydrocarbons. The Department of Scientific and Industrial Research, the principle Government R & D Agency, and advisor to government and industry in science and technology, has a vacancy in its Geological Survey for a seismic interpreter. The position, in the Petroleum and Basin Studies Section requires a person with a sound geological background primarily for regional analysis for the Basin Studies Programme. Qualifications: A good 4 year bachelor's degree or higher, and at least 3 years petroleum exploration experience, are preferred.

Salary: A salary of up to NZ\$23,520 per annum is offered for this position, depending on qualifications and experience.

Further information, application forms etc., may be obtained from the Ambassador Extraordinary and Plenipotentiary, New Zealand Embassy, Washington D.C. Applicants should quote Vacancy No. 2657 and forward applications, accompanied by a resume, to:

The Ambassador Extraordinary and Plenipotentiary
New Zealand Embassy
Observatory Circle, NW
Washington DC 20008

United States of America

Closing date for applications November 3, 1981.

